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Michael L. Boucher

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SUN MICROSYSTEMS

C/O SONNENSCHN NATH & ROSENTHAL LLP

P.O. BOX 061080

WACKER DRIVE STATION, WILLIS TOWER

CHICAGO, IL 60606-1080

EXAMINER

DENG, ANNA CHEN

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/840,069	<b>Applicant(s)</b> BOUCHER, MICHAEL L.	
	<b>Examiner</b> ANNA DENG	<b>Art Unit</b> 2191	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 17 August 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/17/2009 has been entered.

2. Claims 1, 17, 13 and 16 have been amended.

3. Claims 1-16 are pending.

### ***Response to Amendment***

#### ***Claim Rejections - 35 USC § 101***

4. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. Claims 7-12 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 7-12 set forth a computer-readable storage medium. However, the Specification, page 12, lines 18-22, recites "the present invention may be stored on or read from other computer-readable media, such as secondary storage devices, like hard disks, floppy disks, and CD-ROM; a carrier wave received from network such as

Art Unit: 2191

the Internet..." and page 17, lines 11-13, "A computer-readable medium may include a magnetic or optical or other tangible medium ..., but can also be a signal (e.g., analog or digital)...". The Specification does not clearly define a "computer-readable storage medium", instead the Specification define a computer-readable medium that include signal, carrier wave that are non-statutory subject matter.

The applicant is advised to amend the Specification to clarify a computer-readable storage medium by amend page 12, lines 21-22, to

-- computer-readable media, such as ~~secondary~~ computer-readable storage ~~devices~~ media, like hard disks, floppy disks, and CD-ROM; a carrier wave received from a network such as the Internet; or other forms of ROM--

### ***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1-16 are rejected under 35 U.S.C. 102 (e) as being anticipated by Arnold et al. USPN 6,971,091 B1 (hereinafter Arnold).

**Per Claim 1 (currently amended):**

Arnold discloses:

**A method in a data processing system for optimizing a program** (Arnold, col. 4, lines 12-17, system and method for adaptively optimizing a computer program executing in an execution environment, the execution environment comprising one or more compiler devices for providing various levels of program optimization), **the method comprising the steps of:**

**automatically analyzing a statistical profile of a program execution** (Arnold, col. 4, lines 20-25, a controller device for receiving the characterized raw profile data from the runtime measurements sub-system and analyzing the data for determining whether a level of program optimization for the executing program is to be performed by a compiler device); and

**automatically optimizing object code of the program based on the analysis, information about at least one prior compilation of the program, and information about at least one prior optimization of the program, wherein the automatic optimizing includes determining that additional information is required to optimize the object code of the program, performing a first compiling of a portion of the program, executing the first compiled portion of the program, gathering the additional information, and performing a second compiling of the portion of the program using the gathered additional information** (Arnold, col. 4, lines 17-31, a runtime measurements sub-system for monitoring execution of the computer program (first compiling executable program) to be optimized, the monitoring including obtaining raw profile data samples and characterizing the raw profile data... the controller

Art Unit: 2191

generating a compilation plan in accordance with a determined level of optimization, and, a recompilation sub-system (second compiling) for receiving a compilation plan from the controller and invoking a compiler device for performing the level of program optimization of the executing program in accordance with the compilation plan; also, see FIG. 2, col. 6, lines 43-51, each organizer 215 analyzes raw data and package the data into a suitable format 221 for input to the controller. Additionally, an organizer 215 may add information to an organizer event queue 220 for the controller to process...), and

**the automatic optimizing includes selecting, from among a the plurality of optimization techniques and based on logical relations between said optimization techniques, a not previously tried one of the plurality of optimization techniques if a previously tried optimization technique was unsuccessful** (Arnold, col. 7, lines 31- col. 8, line 10, The optimization plan specifies which optimizations a compiler should apply during recompilation. The profiling data, initially gathered by the runtime measurements subsystem directs the optimizing compiler's feedback-directed optimizations. Instrumentation plans dictate which, if any, intrusive instrumentation the compiler should insert into the generated code (*automatic select optimization techniques*). For instance, the controller communicates to the recompilation subsystem 272 any value- or control flow-based information reported by the runtime measurements system... the controller may also direct the compiler to insert instrumentation to obtain fine-grain profiling information of the method. The recompilation subsystem takes the output of the compiler, a Java object that represents the executable code and associated runtime information (exception table information (*unsuccessful information*))

Art Unit: 2191

and garbage collection maps), and installs it in the JVM 101, so that all future calls to this method will use a new version (*a not previously tried one*). AOS Database, The AOS database 260 provides a repository where the adaptive optimization system records decisions, events, and static analysis results. The various adaptive system components query these artifacts as needed. For example, the controller 242 uses the AOS database to record compilation plans and to track the status and history of methods selected for recompilation. The compilation threads also record the time taken to execute each compilation plan in the database. The data on previous compilation plans executed for a method may then be queried by the controller to provide some of the inputs to the recompilation model describe above with method to recompilation. As another example, the compilation threads record static analysis and inlining summaries produced by the optimizing compiler. The controller and organizer threads query this information as needed to guide recompilation decisions...to detect when a previously optimized method should be considered for further optimization because the current profiling data indicates an opportunity for new inlining opportunities that were missed when the method was originally optimized (detect the previously optimized method (*note that, the previously unsuccessful should be detected*) should be considered for further optimization (*other than the previously optimized method*)).

**Per Claim 2:**

Arnold discloses:

**wherein the program is automatically optimized during a compilation**

(Arnold, col. 5, lines 11-15, an optimizing compiler for translating bytecodes into an intermediate representation, upon which it performs a variety of optimizations).

**Per Claim 3:**

Arnold discloses:

**wherein the program is automatically optimized during a run-time**

**compilation** (Arnold, col. 2, lines 23-33, runtime environments and tools can benefit from runtime feedback from a program....Java virtual machines may use runtime feedback to guide optimization of the running program...identify sections of the program where significant runtime is spent and recompiles those sections with an optimizing compiler; also, col. 5, lines 3-7, the principles of adaptive optimization as described herein may be applicable for any run-time environment, e.g., JVM, interpreters, Just-in-Time compilers, etc).

**Per Claim 4:**

Arnold discloses:

**the steps of interrupting the program** (Arnold, col. 9, lines 28-40, interrupt handler is coded to catch the timer interrupt. When interrupt handler is code to catches the interrupt...a sample is collected...);

**recording an execution state of the program** (Arnold, col. 7, lines 57-64, uses the AOS database to record compilation plans and to track the status and history of



Art Unit: 2191

methods selected for recompilation. The compilation threads also record the time taken to execute each compilation plan ... data on previous compilation plans executed ...); and

**storing the recorded execution state to create the statistical profile** (Arnold, col. 7, lines 53-56, The AOS database 260 provides a repository where the adaptive optimization system records decisions, events, and static analysis results (statistical profile)).

**Per Claim 5:**

Arnold discloses:

**wherein the information about at least one prior compilation of the program includes a profile of the program implemented during the at least one prior compilation** (Arnold, col. 6, lines 34-37, the runtime measurement subsystem gathers information about executing Java methods (including those of the JVM itself-compilation (prior compilation) see, col. 5, lines 9-15)).

**Per Claim 6:**

Arnold discloses:

**wherein the information about at least one prior optimization of the program includes a profile of at least one change made to the program during the at least one prior compilation** (Arnold, col. 11, lines 62-65, It may also be desirable to decrease sampleSize (profile information) when the application's working set is rapidly

Art Unit: 2191

changing to enable the controller to quickly identify the new set of important methods to optimize).

**Claims 7-12:**

These are computer-readable storage medium versions of the claimed method above (claims 1-6, respectively), wherein all claim limitations also have addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Arnold).

**Claims 13-15:**

These are data processing system versions of the claimed method above (claims 1-3, respectively), wherein all claim limitations also have addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Arnold).

**Claim 16:**

This is another data processing system version of the claimed method above (claim 1), wherein all claim limitations also have addressed and/or covered in cited areas as set forth above. Thus, accordingly, this claim is also anticipated by Arnold).

***Response to Arguments***

8. Applicant's arguments with respect to claims 1, 7, 13 and 16 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argued:

Claims 1, 7, 13, and 16 have been amended to clarify that automatic optimizing object code of the program includes selecting, from among a plurality of optimization techniques and based on logical relations between said optimization techniques, a not previously tried one of optimization techniques if a previously tried optimization technique was unsuccessful...Arnold discusses a recompilation scheme in which a previously optimized program is considered for reoptimization if profiling data indicates that optimizing opportunities were missed during a prior optimization.

Examiner response:

The Examiner disagrees applicant's argument. Arnold actually teaches the amended limitation "the automatic optimizing includes selecting, from among a plurality of optimization techniques and based on logical relations between said optimization techniques, a not previously tried one of the plurality of optimization techniques if a previously tried optimization technique was unsuccessful, see Arnold, col. 7, lines 31-col. 8, line 10, The optimization plan specifies which optimizations a compiler should apply during recompilation. The profiling data, initially gathered by the runtime measurements subsystem directs the optimizing compiler's feedback-directed

Art Unit: 2191

optimizations. Instrumentation plans dictate which, if any, intrusive instrumentation the compiler should insert into the generated code (*automatic select optimization techniques*). For instance, the controller communicates to the recompilation subsystem 272 any value- or control flow-based information reported by the runtime measurements system... the controller may also direct the compiler to insert instrumentation to obtain fine-grain profiling information of the method. The recompilation subsystem takes the output of the compiler, a Java object that represents the executable code and associated runtime information (exception table information (*unsuccessful information*) and garbage collection maps), and installs it in the JVM 101, so that all future calls to this method will use a new version (*a not previously tried one*). AOS Database, The AOS database 260 provides a repository where the adaptive optimization system records decisions, events, and static analysis results. The various adaptive system components query these artifacts as needed. For example, the controller 242 uses the AOS database to record compilation plans and to track the status and history of methods selected for recompilation. The compilation threads also record the time taken to execute each compilation plan in the database. The data on previous compilation plans executed for a method may then be queried by the controller to provide some of the inputs to the recompilation model describe above with method to recompilation. As another example, the compilation threads record static analysis and inlining summaries produced by the optimizing compiler. The controller and organizer threads query this information as needed to guide recompilation decisions...to detect when a previously optimized method should be considered for further optimization because the current

Art Unit: 2191

profiling data indicates an opportunity for new inlining opportunities that were missed when the method was originally optimized (detect the previously optimized method (*note that, the previously unsuccessful should be detected*) should be considered for further optimization (*here, the further optimization is other than the previously optimized method*). Thus, Arnold teaches the amended limitation "...selecting, from among a plurality of optimization techniques and based on logical relations between said optimization techniques, a not previously tried one of the plurality of optimization techniques if a previously tried optimization technique was unsuccessful" as recite in independent claims 1, 7, 13, and 16.

### **Conclusion**

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anna Deng whose telephone number is 571-272-5989. The examiner can normally be reached on Monday to Friday 9:30 AM - 6:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wei Zhen can be reached at 571 -272-3708. The fax phone number for the organization where this application or proceeding is assigned is 703-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

Art Unit: 2191

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Anna Deng/

Primary Examiner, Art Unit 2191